

Integrating human and ecological risk assessment: Application to the cyanobacterial harmful algal bloom problem

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Abstract:

Environmental and public health policy continues to evolve in response to new and complex social, economic and environmental drivers. Globalization and centralization of commerce, evolving patterns of land use (e.g., urbanization, deforestation), and technological advances in such areas as manufacturing and development of genetically modified foods have created new and complex classes of stressors and risks (e.g., climate change, emergent and opportunist disease, sprawl, genomic change). In recognition of these changes, environmental risk assessment and its use are changing from stressor-endpoint specific assessments used in command and control types of decisions to an integrated approach for application in community-based decisions. As a result, the process of risk assessment and supporting risk analyses are evolving to characterize the human-environment relationship. Integrating risk paradigms combine the process of risk estimation for humans, biota, and natural resources into one assessment to improve the information used in environmental decisions (Suter et al. 2003b). A benefit to this approach includes a broader, system-wide evaluation that considers the interacting effects of stressors on humans and the environment, as well the interactions between these entities. To improve our understanding of the linkages within complex systems, risk assessors will need to rely on a suite of techniques for conducting rigorous analyses characterizing the exposure and effects relationships between stressors and biological receptors. Many of the analytical techniques routinely employed are narrowly focused and unable to address the complexities of an integrated assessment. In this paper, we describe an approach to integrated risk assessment, and discuss qualitative community modeling and Probabilistic Relational Modeling techniques that address these limitations and evaluate their potential for use in an integrated risk assessment of cyanobacteria.

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Resource Description

Communication: M

resource focus on research or methods on how to communicate or frame issues on climate change; surveys of attitudes, knowledge, beliefs about climate change

A focus of content

Communication Audience: M

audience to whom the resource is directed

Climate Change and Human Health Literature Portal

Policymaker

Early Warning System: M

resource focus on systems used to warn populations of high temperatures, extreme weather, or other elements of climate change to prevent harm to health

A focus of content

Exposure: M

weather or climate related pathway by which climate change affects health

Food/Water Quality

Food/Water Quality: Biotoxin/Algal Bloom

Geographic Feature: M

resource focuses on specific type of geography

Freshwater, Ocean/Coastal

Geographic Location: M

resource focuses on specific location

United States

Health Impact: M

specification of health effect or disease related to climate change exposure

Other Health Impact

Other Health Impact: Cyanobacterial toxin poisoning

Intervention: M

strategy to prepare for or reduce the impact of climate change on health

A focus of content

mitigation or adaptation strategy is a focus of resource

Adaptation

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Population of Concern: A focus of content

Population of Concern: M

populations at particular risk or vulnerability to climate change impacts

Children, Elderly, Pregnant Women

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Resource Type: **™**

format or standard characteristic of resource

Research Article

Resilience: M

capacity of an individual, community, or institution to dynamically and effectively respond or adapt to shifting climate impact circumstances while continuing to function

A focus of content

Timescale: M

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment: **☑**

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content